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PROGRESS REPORT

FOR

THE PERIOD DECEMBER 1973-FEB. 1974

FOR

SKYLAB STUDY OF WATER QUALITY

NASA CONTRACT NAS 9-13271

(E74-10466) SKYLAB STUDY OF WATER QUALITY Progress Report, Dec. 1973 - Feb. 1974 (Kansas Univ. Center for Research, Inc.) 11 p HC $4.00 CSCL 08H G3/13

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EREP PROPOSAL NO. 540-G1

TASK-347

SITES-416 + 423

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SUMMARY OF RESEARCH OBJECTIVES

Two Kansas reservoirs will be studied using Skylab data in conjunction with simultaneous ground truth information in an attempt to detect and monitor various parameters of water quality. Water samples will be collected from the reservoir or reservoirs under investigation and low-level aircraft support missions will be flown to acquire photographs which will approximate the spectral coverage of forthcoming Skylab photographs. Image analysis and data processing techniques will be developed to aid in the correlation of Skylab data with ground truth data and supporting aerial photography.

A. OVERALL STATUS

Potential EREP data-taking missions occurred in January 1974 over our primary study areas Perry and Tuttle Creek Reservoirs, however both lakes were frozen and snow covered as were virtually all lakes in Kansas at that time.

EREP data collected over Southeast Kansas on Sept. 18, 1973 along track 58 has been received and initial analysis has begun. Comparison will be made between the spectral reflectance of the lakes and the water quality parameters of the samples collected at time of overflight. Figures 1, 2, 3 and 4 show the sampling schemes used on the four lakes lying along the imaging path: Redmond, Toronto, Fall River and Elk City. The results of the chemical analyses of the samples collected on these lakes are presented in Tables 1, 2, 3 and 4.

B. RECOMMENDATIONS CONCERNING DECISIONS AND/OR ACTIONS REQUIRED TO ENSURE ATTAINMENT OF THE EXPERIMENT'S SCIENTIFIC OBJECTIVES.

None.

C. EXPECTED ACCOMPLISHMENTS DURING THE NEXT REPORTING PERIOD.

Data collected by the September 18th EREP mission will be compared with water quality ground truth to determine those parameters which can be detected and monitored by Skylab-type sensors. Film analysis will be performed visually as well as with the IDECS (Image Discrimination Enhancement and Combination System) of the Remote Sensing Lab. CCT's will be analyzed also using tape reading programs.

D. SIGNIFICANT RESULTS AND THEIR RELATIONSHIPS TO PRACTICAL APPLICATIONS OR OPERATIONAL PROBLEMS.

None.

E. SUMMARY OUTLOOK FOR THE REMAINING EFFORT TO BE PERFORMED.

Visual inspection of S-190-A and S-190-B photos of the lakes in the southeast Kansas shows little variation in tone on any given lake in any given band. Experience from ERTS studies have shown total suspended solids to be the dominant factor in reflectance from reservoirs in Kansas. Fairly uniform distribution of total suspended solids for the lakes as demonstrated by sample analysis appears responsible for the uniform tones. Significantly different appearances of the lakes on different bands does exist however, and these differences will be studied to see how they relate to water parameters. Film analysis will be hampered by the small size of the lakes and also by partial cloud cover of some of the lakes. It is believed however that enough data is available to make conclusions concerning the abilities of Skylab sensors to detect and measure components of water quality.

F. TRAVEL SUMMARY AND PLANS

None.

G. FINANCIAL REPORT

A statement of financial status for this project will be sent under separate cover by the CRINC accounting office.

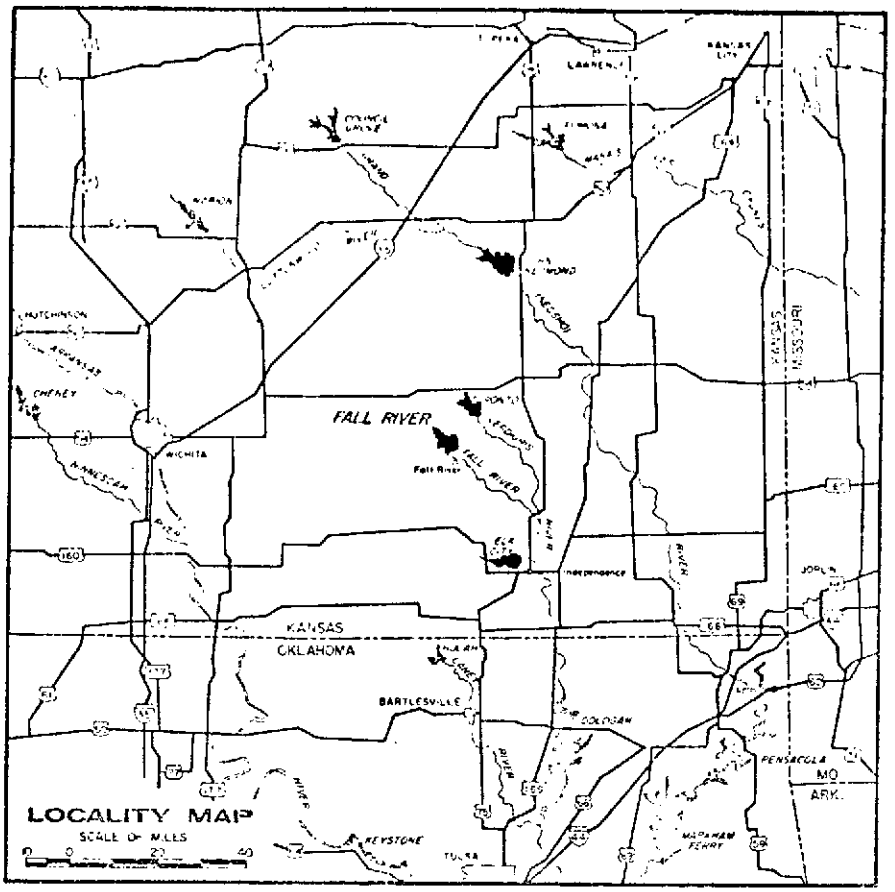

FIG. 1 REDMOND RES.

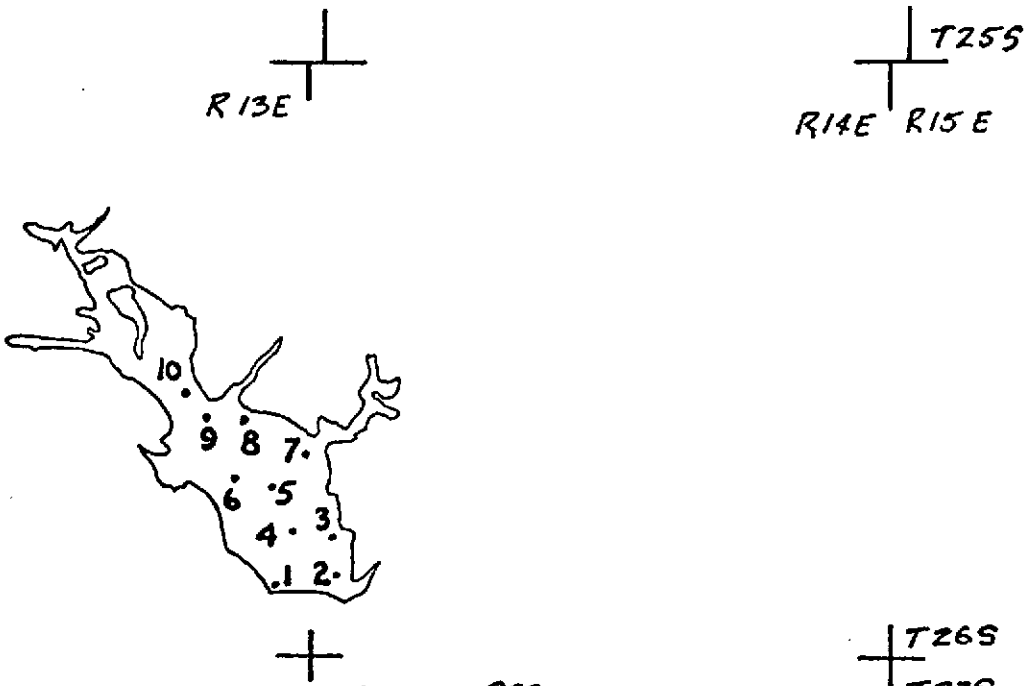

FIG. 2 TORONTO RES.

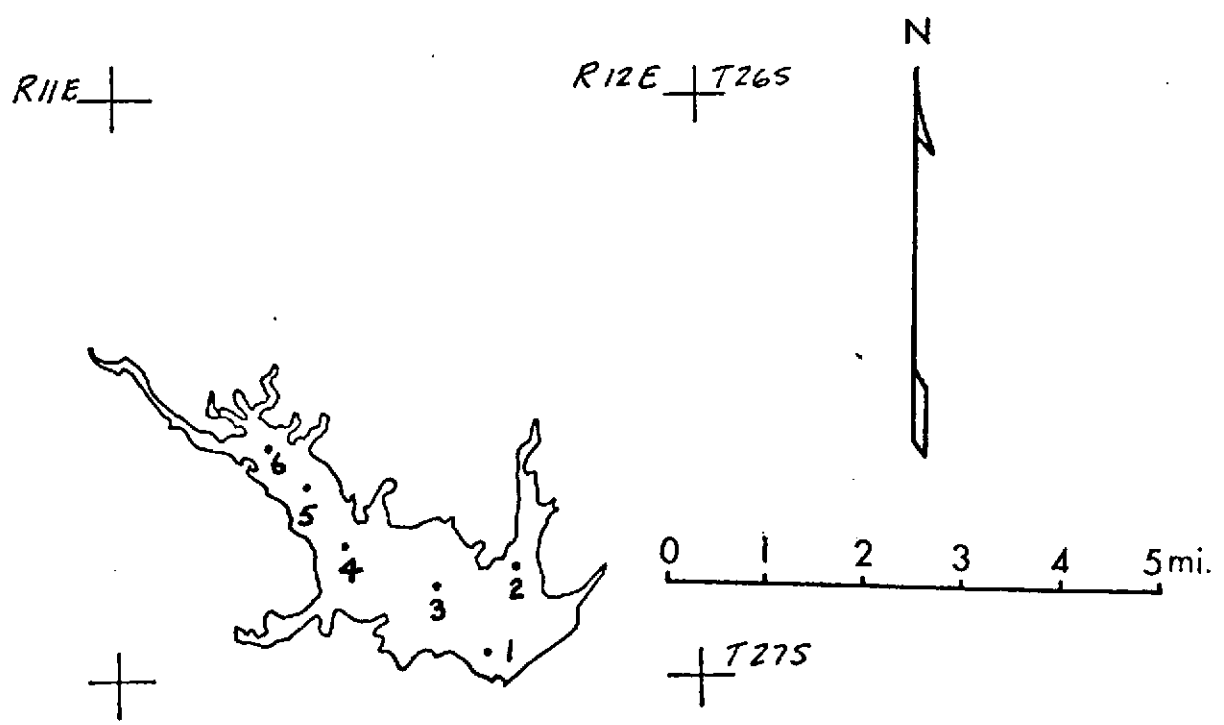

FIG. 3 FALL RIVER RES.

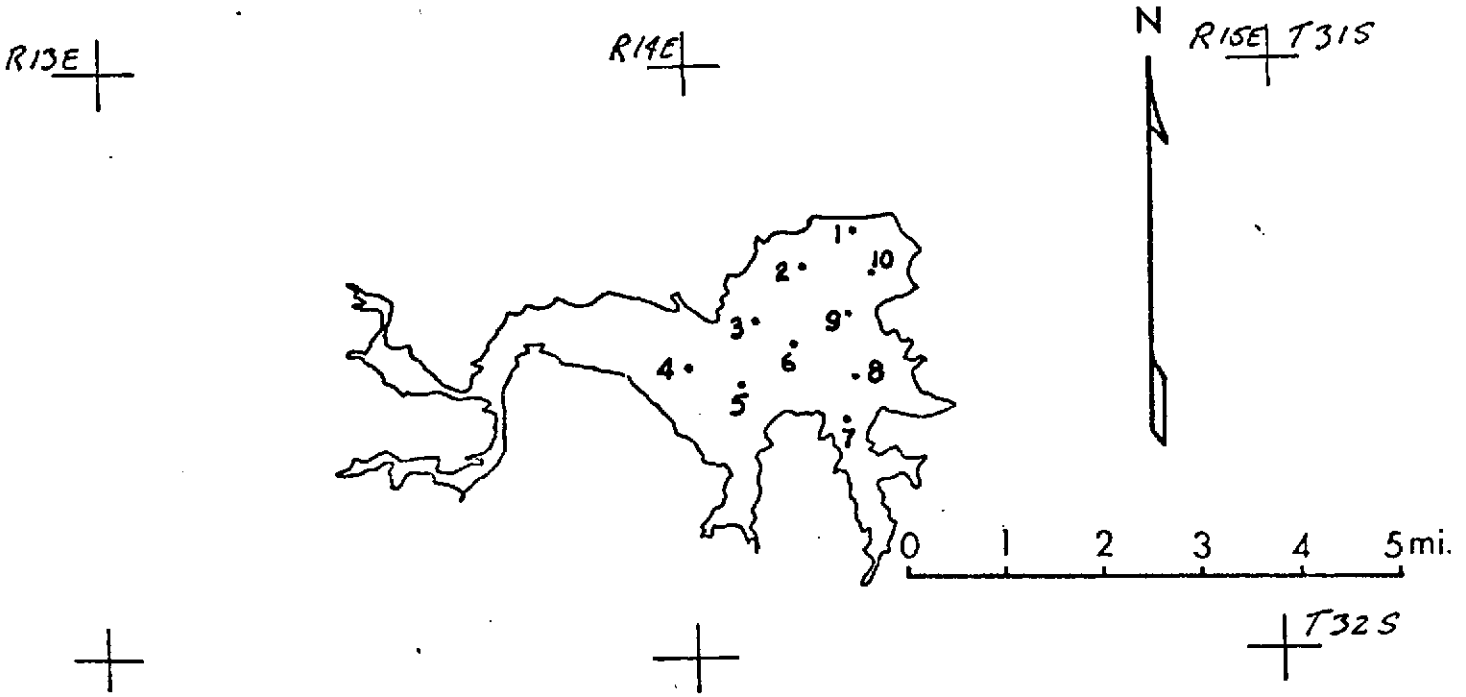

FIG. 4 ELK CITY RES.

TABLE 1
REDMOND
SAMPLE SITES

CONC. (PPM)	1	2	3	4	5	6	7	8	9	10
Bicarbonate	163.6	160.2	163.4	162.0	160.0	160.2	154.8	162.2	157.8	167.0
Carbonate	2.0	4.0	2.6	2.8	3.0	3.0	6.0	2.6	4.0	4.0
Calcium	61.5	61.5	61.3	62.0	62.1	60.7	62.4	62.1	61.6	62.7
Magnesium	7.8	7.83	7.85	7.87	7.92	7.96	7.93	7.89	7.85	7.76
Potassium	3.7	4.4	4.8	4.9	5.0	5.3	5.3	5.1	5.1	5.0
Sodium	17.5	18.0	18.0	18.1	18.1	17.5	17.7	17.3	17.3	17.3
Sulfate	46.9	72.5	68.6	67.6	68.3	68.6	59.7	72.4	57.5	56.6
Chloride	22.9	23.5	24.2	24.0	25.3	24.5	19.9	23.7	20.7	19.3
Total Solids	343.0	339.0	343.0	345.0	355.0	361.0	351.0	348.0	344.0	347.0
Total Heat Stable Solids	235.0	244.0	251.0	253.0	287.0	260.0	255.0	251.0	254.0	256.0
Susp. Solids	35.0	36.0	33.0	35.0	42.0	37.0	37.0	37.0	45.0	53.0
Susp. Heat Stable Solids	29.0	30.0	28.0	30.0	35.0	32.0	31.0	31.0	31.0	45.0
Total Alk. ($CaCO_3$)	167.6	168.2	168.6	168.4	166.0	166.2	166.8	167.4	165.8	167.0

TABLE 2
TORONTO
SAMPLE SITES

CONC. (PPM)	1	2	3	4	5	6	7	8	9	10
Bicarbonate	113.0	112.0	114.0	115.0	102.0	97.0	115.0	106.0	96.0	106.0
Carbonate	0	0	0	0	0	0	0	0	0	0
Calcium	40.1	39.7	41.3	41.3	38.0	41.3	36.7	38.7	37.4	32.6
Magnesium	8.51	8.66	4.46	4.49	4.28	4.6	4.04	4.31	4.08	3.57
Potassium	2.9	3.0	3.1	3.2	3.4	3.6	3.2	3.4	3.5	3.5
Sodium	18.3	17.5	18.3	18.4	16.6	18.6	15.3	16.6	16.1	12.7
Sulfate	23.1	22.6	21.1	22.4	14.2	22.1	16.1	20.7	25.5	21.0
Chloride	32.7	34.8	35.1	33.3	30.0	36.1	29.9	33.2	20.1	20.0
Total Solids	237.0	269.0	210.0	210.0	235.0	251.0	265.0	248.0	247.0	243.0
Total Heat Stable Solids	203.0	195.0	195.0	197.0	196.0	190.4	195.0	194.0	199.0	212.0
Susp. Solids	58.0	63.0	63.0	62.0	85.0	66.0	89.0	72.0	88.0	107.00
Susp. Heat Stable Solids	51.0	56.0	55.0	54.0	71.0	57.0	77.0	64.0	79.0	93.0
Total Alk. ($CaCO_3$)	113.0	112.0	114.0	115.0	102.0	97.0	115.0	106.0	96.0	106.0

TABLE 3
FALL RIVER
SAMPLE SITES

CONC. (PPM)	1	2	3	4	5	6
Bicarbonate	140.4	139.0	139.0	139.0	138.0	140.0
Carbonate	0	0	0	0	0	0
Calcium	47.5	47.6	47.6	46.8	46.6	46.6
Magnesium	11.8	12.0	12.1	12.0	11.7	12.2
Potassium	4.3	4.0	4.3	4.3	4.1	4.0
Sodium	22.8	23.5	24.0	21.5	20.0	20.0
Sulfate	22.3	24.7	23.5	23.5	23.2	23.5
Chloride	45.4	43.2	47.7	46.0	44.2	44.1
Total Solids	287.0	296.0	291.0	301.0	333.0	291.0
Total Heat Stable Solids	189.0	184.0	194.0	197.0	235.0	221.0
Susp. Solids	36.0	36.0	41.0	44.0	42.0	37.0
Susp. Heat Stable Solids	24.0	30.0	34.0	36.0	34.0	36.0
Total Alk. ($CaCO_3$)	140.4	139.0	139.0	139.0	138.0	140.0

TABLE 4
ELK CITY
SAMPLE SITES

CONC. (PPM)	1	2	3	4	5	6	7	8	9	10
Bicarbonate	140.0	139.0	140.0	137.0	140.0	139.0	140.0	136.0	139.0	140.0
Carbonate	0	4.0	4.0	0	0	4.0	0	2.0	1.0	4.0
Calcium	50.9	51.1	51.1	52.2	51.5	51.4	51.3	51.5	51.3	51.4
Magnesium	8.64	8.55	8.79	9.15	8.74	8.72	8.79	8.7	9.19	9.32
Potassium	4.5	4.7	4.5	4.9	5.1	4.8	4.8	4.9	4.8	4.7
Sodium	14.3	14.0	14.0	14.4	14.6	13.8	13.9	13.6	13.5	13.5
Sulfate	24.2	24.8	25.5	24.2	26.6	23.2	25.8	24.2	27.0	25.5
Chloride	22.3	25.7	24.2	25.8	27.3	25.3	23.3	24.4	24.4	23.9
Total Solids	207.0	210.0	211.0	225.0	223.0	212.0	223.0	222.0	218.0	219.0
Total Heat Stable Solids	162.0	167.0	160.0	178.0	187.0	166.0	172.0	173.0	185.0	180.0
Susp. Solids	31.0	19.0	28.0	44.0	31.0	31.0	31.0	29.0	30.0	25.0
Susp. Heat Stable Solids	27.0	15.0	23.7	38.0	27.0	24.0	27.0	25.0	26.0	22.0
Total Alk. ($CaCO_3$)	140.0	139.0	140.0	137.0	140.0	139.0	140.0	140.0	141.0	140.0